

DATA SHEET

74ABT16541

74ABTH16541

16-bit buffer/line driver (3-State)

Product specification
Supersedes data of 1995 Sep 18
IC23 Data Handbook

1998 Feb 25

16-bit buffer/line driver (3-State)

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74ABTH16541

FEATURES

- Power-up 3-State
- Multiple V_{CC} and GND pins minimize switching noise
- Provides ideal interface and increases fan-out of MOS Microprocessors
- 3-State buffers sink 64mA and source 32mA
- 74ABTH16541 incorporates bus-hold data inputs which eliminate the need for external pull-up resistors to hold unused inputs
- Latch-up protection exceeds 500mA per Jedec Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model
- Two 8-bit bus interfaces
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs

DESCRIPTION

The 74ABT16541 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT16541 has two octal buffers that are ideal for driving bus lines. The outputs are all capable of sinking 64mA and sourcing 32mA.

Two options are available, 74ABT16541 which does not have the bus-hold feature and 74ABTH16541 which incorporates the bus-hold feature.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}\text{C}$; GND = 0V	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay nAx to nYx	$C_L = 50\text{pF}$; $V_{CC} = 5\text{V}$	2.0 1.5	ns
C_{IN}	Input capacitance	$V_I = 0\text{V}$ or V_{CC}	4	pF
C_{OUT}	Output capacitance	$V_O = 0\text{V}$ or V_{CC} ; 3-State	6	pF
I_{CCZ}	Quiescent supply current	Outputs disabled; $V_{CC} = 5.5\text{V}$	500	μA
I_{CCL}		Outputs LOW; $V_{CC} = 5.5\text{V}$	8	mA

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
48-Pin Plastic SSOP Type III	-40°C to $+85^{\circ}\text{C}$	74ABT16541 DL	BT16541 DL	SOT370-1
48-Pin Plastic TSSOP Type II	-40°C to $+85^{\circ}\text{C}$	74ABT16541 DGG	BT16541 DGG	SOT362-1
48-Pin Plastic SSOP Type III	-40°C to $+85^{\circ}\text{C}$	74ABTH16541 DL	BH16541 DL	SOT370-1
48-Pin Plastic TSSOP Type II	-40°C to $+85^{\circ}\text{C}$	74ABTH16541 DGG	BH16541 DGG	SOT362-1

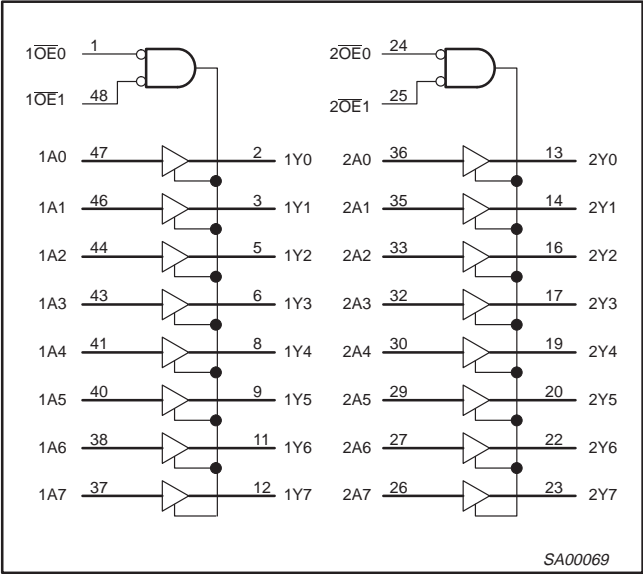
PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
47, 46, 44, 43, 41, 40, 38, 37, 36, 35, 33, 32, 30, 29, 27, 26	1A0 - 1A7 2A0 - 2A7	Data inputs
2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 16, 17 19, 20, 22, 23	1Y0 - 1Y7, 2Y0 - 2Y7	Data outputs
1, 48 24, 25	$\overline{1OE0}$, $\overline{1OE1}$, $\overline{2OE0}$, $\overline{2OE1}$	Output enables
4, 10, 15, 21 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V_{CC}	Positive supply voltage

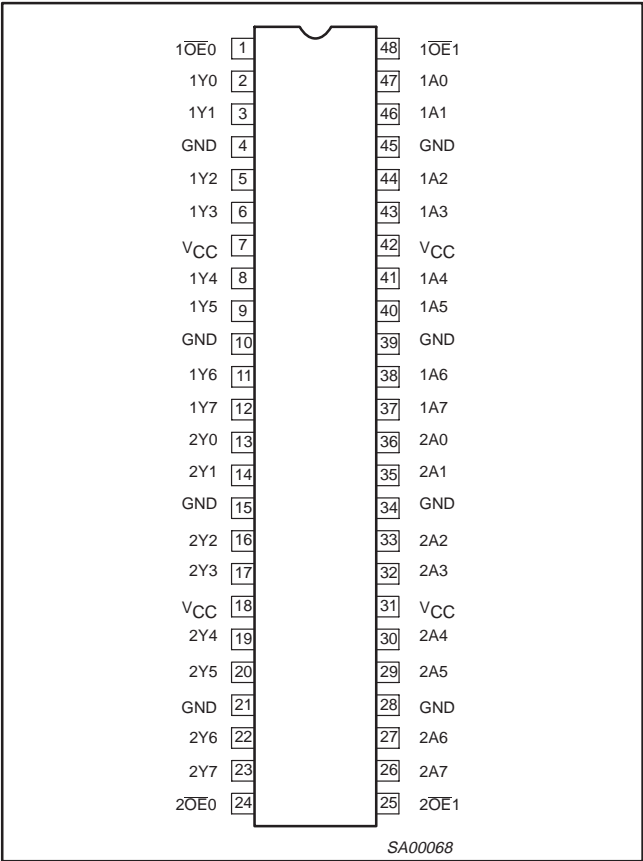
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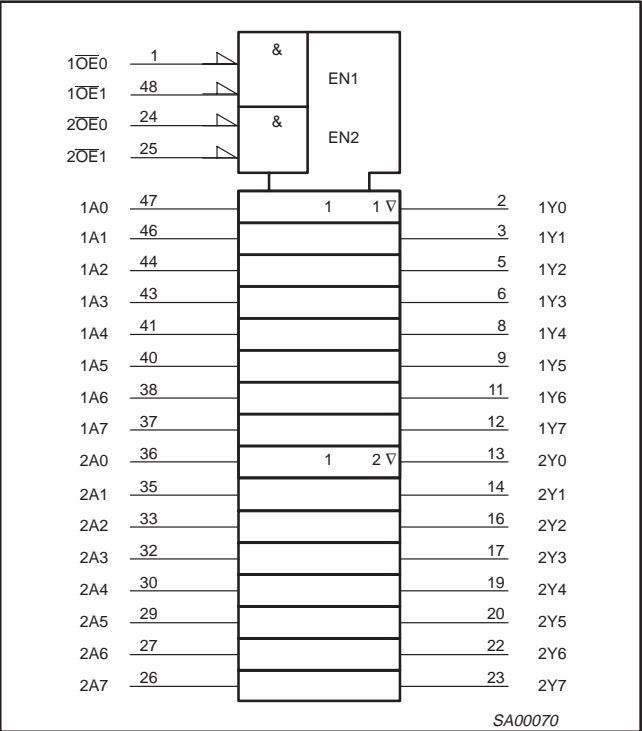
LOGIC SYMBOL



PIN CONFIGURATION



LOGIC SYMBOL (IEEE/IEC)



FUNCTION TABLE

INPUTS			OUTPUTS
nOE0	nOE1	nlx	nYx
L	L	L	L
L	L	H	H
X	H	X	Z
H	X	X	Z

H = HIGH voltage level
L = LOW voltage level
X = D0n't care
Z = High impedance "off" state

16-bit buffer/line driver (3-State)

74ABT16541
74ABTH16541ABSOLUTE MAXIMUM RATINGS^{1, 2}

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		-0.5 to +7.0	V
I_{IK}	DC input diode current	$V_I < 0$	-18	mA
V_I	DC input voltage ³		-1.2 to +7.0	V
I_{OK}	DC output diode current	$V_O < 0$	-50	mA
V_{OUT}	DC output voltage ³	output in Off or High state	-0.5 to +5.5	V
I_{OUT}	DC output current	output in Low state	128	mA
T_{stg}	Storage temperature range		-65 to 150	°C

NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		Min	Max	
V_{CC}	DC supply voltage	4.5	5.5	V
V_I	Input voltage	0	V_{CC}	V
V_{IH}	High-level input voltage	2.0		V
V_{IL}	Low-level Input voltage		0.8	V
I_{OH}	High-level output current		-32	mA
I_{OL}	Low-level output current		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0	10	ns/V
T_{amb}	Operating free-air temperature range	-40	+85	°C

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DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS		LIMITS					UNIT
				T _{amb} = +25°C			T _{amb} = -40°C to +85°C		
				Min	Typ	Max	Min	Max	
V _{IK}	Input clamp voltage	V _{CC} = 4.5V; I _{IK} = -18mA			-0.9	-1.2		-1.2	V
V _{OH}	High-level output voltage	V _{CC} = 4.5V; I _{OH} = -3mA; V _I = V _{IL} or V _{IH}		2.5	2.9		2.5		V
		V _{CC} = 5.0V; I _{OH} = -3mA; V _I = V _{IL} or V _{IH}		3.0	3.4		3.0		V
		V _{CC} = 4.5V; I _{OH} = -32mA; V _I = V _{IL} or V _{IH}		2.0	2.4		2.0		V
V _{OL}	Low-level output voltage	V _{CC} = 4.5V; I _{OL} = 64mA; V _I = V _{IL} or V _{IH}			0.42	0.55		0.55	V
I _I	Input leakage current	V _{CC} = 5.5V; V _I = GND or 5.5V			±0.01	±1.0		±1.0	µA
I _I	Input leakage current 74ABTH16541	V _{CC} = 5.5V; V _I = V _{CC} or GND	Control pins		±0.01	±1		±1	µA
		V _{CC} = 5.5V; V _I = V _{CC}			0.01	1		1	µA
		V _{CC} = 5.5V; V _I = 0	Data pins		-2	-3		-5	µA
I _{HOLD}	Bus Hold current A inputs ³ 74ABTH16541	V _{CC} = 4.5V; V _I = 0.8V		50			50		µA
		V _{CC} = 4.5V; V _I = 2.0V	-75			-75			
		V _{CC} = 5.5V; V _I = 0 to 5.5V	±500						
I _{OFF}	Power-off leakage current	V _{CC} = 0.0V; V _O or V _I ≤ 4.5V			±5.0	±100		±100	µA
I _{PU} /I _{PD}	Power-up/down 3-State output current	V _{CC} = 2.0V; V _O = 0.5V; V _I = GND or V _{CC} ; V _{OE} = V _{CC}			±5.0	±50		±50	µA
I _{OZH}	3-State output High current	V _{CC} = 5.5V; V _O = 2.7V; V _I = V _{IL} or V _{IH}			1.0	10		10	µA
I _{OZL}	3-State output Low current	V _{CC} = 5.5V; V _O = 0.5V; V _I = V _{IL} or V _{IH}			-1.0	-10		-10	µA
I _{CEX}	Output high leakage current	V _{CC} = 5.5V; V _O = 5.5V; V _I = GND or V _{CC}			1.0	50		50	µA
I _O	Output current ¹	V _{CC} = 5.5V; V _O = 2.5V		-50	-70	-180	-50	-180	mA
I _{CCH}	Quiescent supply current	V _{CC} = 5.5V; Outputs High, V _I = GND or V _{CC}			0.5	1.0		1.0	mA
I _{CCL}		V _{CC} = 5.5V; Outputs Low, V _I = GND or V _{CC}			8	19		19	mA
I _{CCZ}		V _{CC} = 5.5V; Outputs 3-State; V _I = GND or V _{CC}			0.5	1.0		1.0	mA
ΔI _{CC}	Additional supply current per input pin ² 74ABT16541	Outputs enabled, one input at 3.4V, other inputs at V _{CC} or GND; V _{CC} = 5.5V			100	250		250	µA
ΔI _{CC}	Additional supply current per input pin ² 74ABTH16541	Outputs enabled, one input at 3.4V, other inputs at V _{CC} or GND; V _{CC} = 5.5V			0.2	1.0		1.0	mA

NOTES:

1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
2. This is the increase in supply current for each input at 3.4V.
3. This is the bus hold overdrive current required to force the input to the opposite logic state.

AC CHARACTERISTICS

GND = 0V; t_R = t_F = 2.5ns; C_L = 50pF, R_L = 500Ω

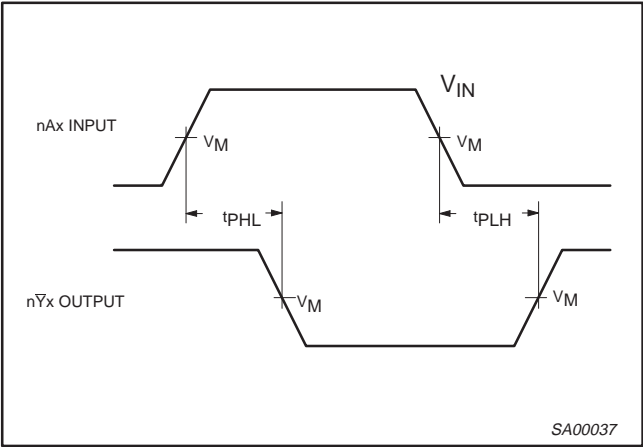
SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			T _{amb} = +25°C V _{CC} = +5.0V			T _{amb} = -40°C to +85°C V _{CC} = +5.0V ±0.5V		
			Min	Typ	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation delay nlx to nYx	1	1.0 1.0	2.0 1.5	3.0 3.6	1.0 1.0	3.4 4.2	ns
t _{PZH} t _{PZL}	Output enable time to High and Low level	2	1.3 1.6	2.9 3.1	4.3 4.7	1.3 1.6	5.2 6.0	ns
t _{PHZ} t _{PLZ}	Output disable time from High and Low level	2	1.3 1.0	3.5 2.8	4.4 3.6	1.3 1.0	5.1 3.9	ns

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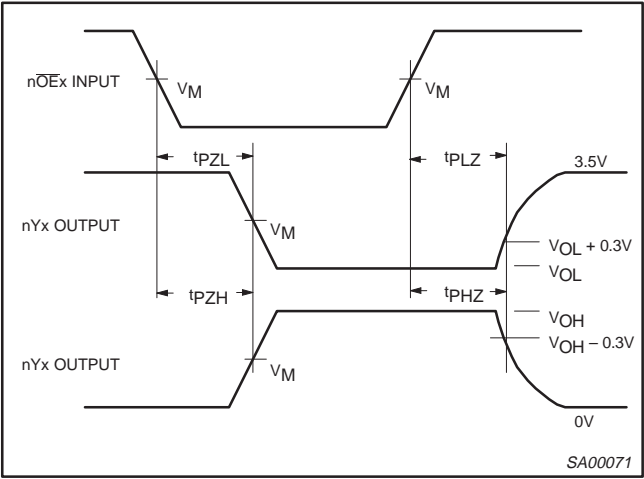
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AC WAVEFORMS

$V_M = 1.5V$, $V_{IN} = GND$ to $3.0V$



Waveform 1. Input (An) to Output (Yn) Propagation Delays



Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS

Test Circuit for 3-State Outputs

SWITCH POSITION

TEST	SWITCH
t_{PLZ}	closed
t_{PZL}	closed
All other	open

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

Input Pulse Definition

$V_M = 1.5V$

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t_W	t_R	t_F
74ABT	3.0V	1MHz	500ns	2.5ns	2.5ns

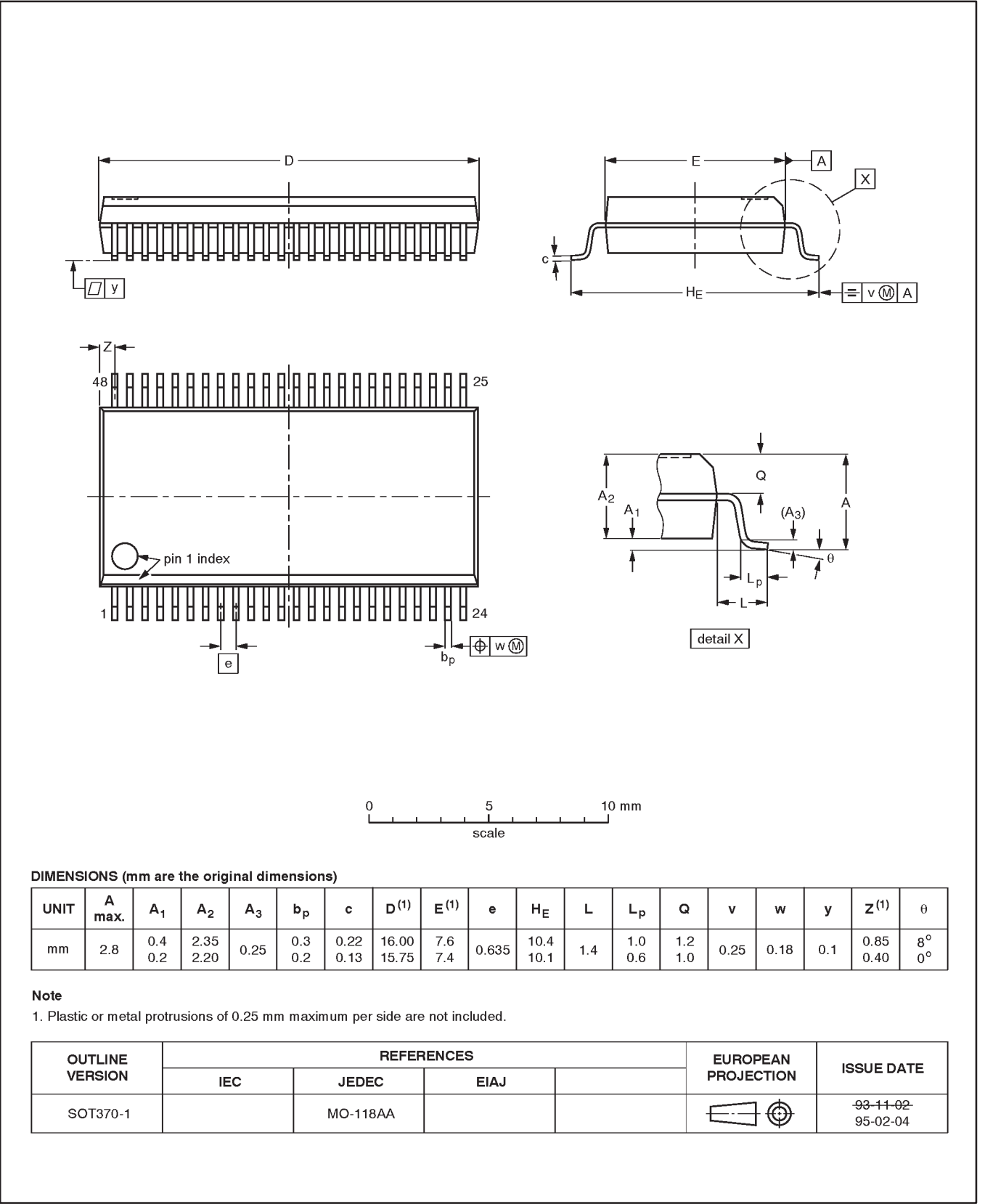
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SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1

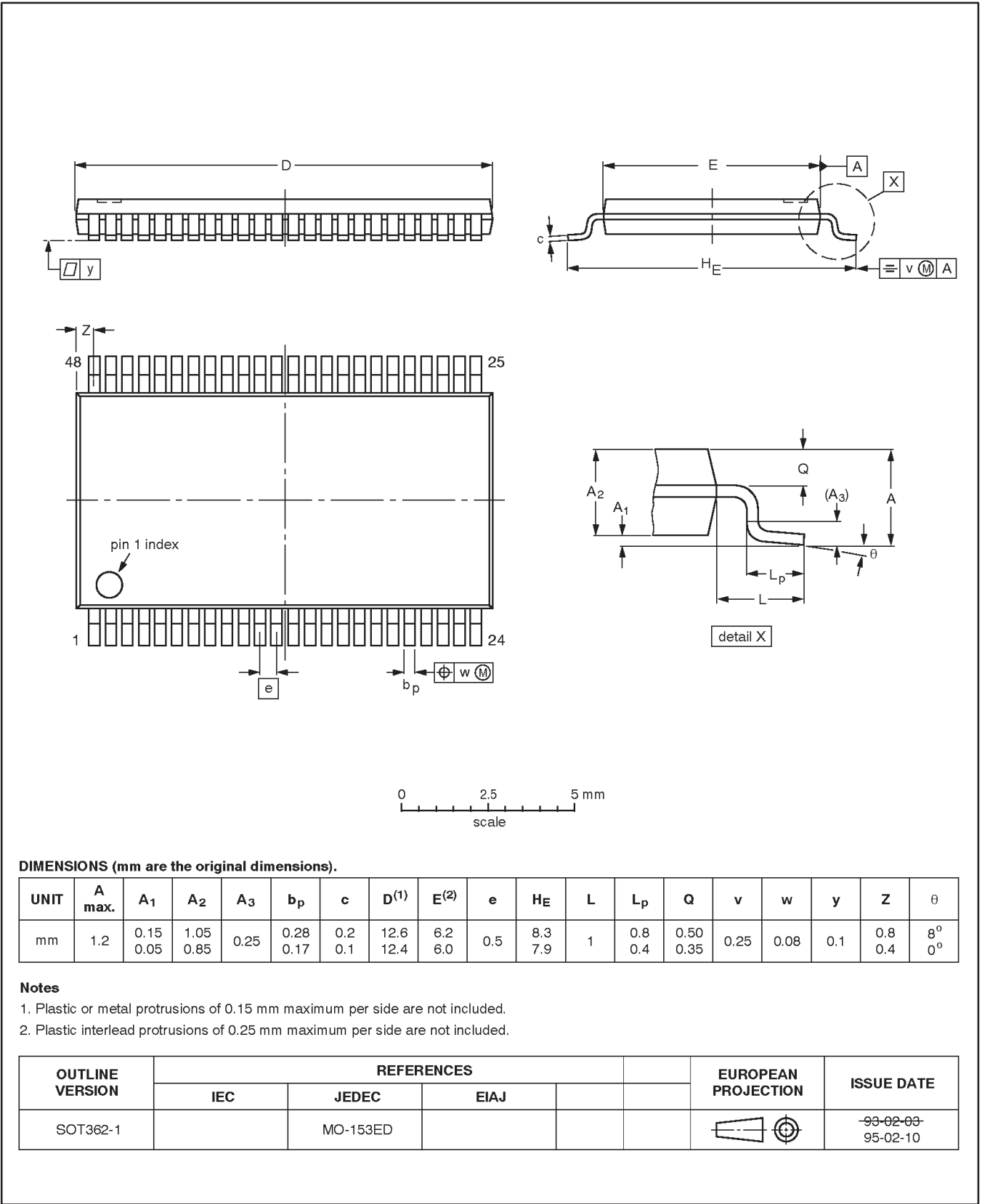


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TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1mm

SOT362-1



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NOTES

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Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088-3409
Telephone 800-234-7381

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